

PATENT APPLICATION

Docket No.: N.C. 79,834

REMARKS

Claims 1-28 are pending in the application. Claims 1-14 and 20-25 have been withdrawn pursuant to restriction and election of species requirements. Claims 27 and 28 have been added by this amendment. Support for claims 27 and 28 is found in the specification at page 6, lines 4-6. This technique has been published in U.S. Patent No. 6,177,151.

Claim Rejections – 35 U.S.C. § 103

The Examiner rejected claims 15, 17-19, and 26 under 35 U.S.C. § 103(a) as being unpatentable over Axtell (US 6,238,847) in view of Joyce (US 5,292,559).

The invention of claim 15 is a method for creating a deposit of a material of interest on a receiving substrate. The method uses a target substrate comprising a laser-transparent support having a back surface and a front surface. The front surface has a coating that comprises a source material that can be transformed into the material of interest. A first laser is directed through the back surface of the target substrate and through the laser-transparent support to strike the coating at a defined target location with sufficient energy to cause the source material to be removed from the surface of the support and deposited on a receiving substrate. A second laser is directed to strike the deposited source material to transform the source material into the material of interest. The lasers and substrates may be moved relative to each other so that a pattern of the material of interest is produced on the receiving substrate.

Axtell discloses a method of marking a substrate by applying a marking material to the surface of the substrate, irradiating a portion of the marking material with a laser, and removing the non-irradiated portion of the marking material (abstract). The irradiated portion is adhered to the substrate (col. 3, lines 4-5). Axtell discloses methods of coating the entire substrate with the marking material (col.7, lines 36-57).

Joyce discloses a method of laser transfer using a laser transparent substrate with a laser absorptive polymer film and a metal containing composite on the film (abstract). The transferred

PATENT APPLICATION
Docket No.: N.C. 79,834

composite is pressure bonded or cold welded to the substrate (col. 3, lines 26-27) resulting in excellent adhesion (col. 3, line 34).

In order to make out a *prima facie* case of obviousness under 35 U.S.C. 103, the rejection must be supported by some reason, suggestion, or modification from the prior art as a whole that indicates that the person of ordinary skill would have combined or modified the references. "It is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the prior art so that the claimed invention is rendered obvious." *In re Fritch*, 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992).

The Examiner has not cited a motivation that is found in the references, but has only stated the conclusion that the combination is obvious. Neither has the Examiner made a finding as to the level of skill in the art or the likelihood of success (as to claims 15, 17, 18, and 26), as required under MPEP 2141.03 and 2143.02.

Further, no such motivation may be found because the references cannot rationally be combined into one process. Axtell is directed toward adhering a material to a substrate. Joyce discloses that there is already excellent adhesion of the transferred composite to the substrate. Thus, marking the transferred composite of Joyce in the manner of Axtell would be a waste of time, because the composite is already adhered. Further, the unmarked material could not be washed off as described in Axtell.

Even if Axtell and Joyce could be combined, neither reference provides a motivation to combine it with the other reference. The process of Joyce forms a pattern that has excellent adhesion to the substrate. There is no motivation found in Joyce to combine it with a process of adhesion, such as that found in Axtell. Axtell discloses coating the marking material on the substrate by various methods that result in coating the entire substrate. (col. 7, lines 50-51.) There is no disclosure or suggestion found in Axtell to apply the marking material in the form of a pattern, such as in Joyce. Axtell is directed to an adhesion problem, not a patterning problem. Neither would it make sense to coat the entire substrate of Axtell by a laser transfer process when

PATENT APPLICATION

Docket No.: N.C. 79,834

simpler and more efficient techniques are disclosed. Further, Axtell is a marking process based on selective exposure of a surface (similar to lithography), while Joyce is an additive process based on the transfer of material in a pattern form (direct-write). One of ordinary skill would not be motivated to combine an exposure method and a transfer method to form only one pattern.

Claims 17-19 depend from and contain all the limitations of claim 15 and are asserted to distinguish from the references in the same manner as claim 15. Claim 26 differs from claim 15 in that it recites a "pulsed laser beam" and a "laser beam" instead of a "first laser" and "second laser," and is asserted to distinguish from the references in the same manner as claim 15.

New claims 27 and 28 add the limitation that the first laser removes the source material from the surface of the support by matrix assisted pulsed laser evaporation direct write (MDW). This laser transfer method is not disclosed in Axtell or Joyce. Joyce uses a laser absorptive polymeric film between the laser transparent substrate and the metal containing composite (Abstract). MDW differs in that the source material is mixed with a matrix material in a single layer instead of being in separate layers.

The Examiner rejected claim 16 under 35 U.S.C. § 103(a) as being unpatentable over Axtell in view of Joyce and further in view of Baum (US 5,220,044).

As explained above Axtell and Joyce cannot be combined. Even if such a combination were possible, Baum does not disclose the step of pretreating the receiving substrate with the first or second laser. Baum discloses heating a substrate to initiate chemical vapor deposition from a gaseous mixture in the vicinity of the substrate. One disclosed method of heating the substrate is to use a laser.

In the invention of claim 16, the receiving substrate is pretreated with a laser. Pretreatment is different from heating. The Merriam-Webster Online Dictionary (www.m-w.com) defines "treat" as "to act upon with some agent especially to improve or alter." (Main entry: 'treat, definition 5). The heating of Baum does not alter or improve the substrate itself. It

PATENT APPLICATION

Docket No.: N.C. 79,834

only causes the deposition of a film on the substrate. The heating is reversible. The pretreatment of claim 16 irreversibly alters or improves the substrate. Examples include texturing the substrate to improve adhesion and micromachining the substrate to produce a non-planar surface.

Merely heating the substrate with a laser in the present invention would likely not be useful. The heating would take place without the target substrate blocking the laser beam from striking the receiving substrate. Such heat may dissipate before the target substrate could be moved back into position for transfer of source material. In contrast, Baum is directed to contemporaneous heating and deposition.

The Examiner rejected claims 15, 17-19, and 26 under 35 U.S.C. § 103(a) as being unpatentable over Axtell in view of Mayer (US 6,159,832).

Mayer discloses a method of laser transfer using an ultrafast laser pulse that vaporizes a portion of an electrically conductive film on a transparent substrate, such that the vaporized film material is propelled toward and deposited upon a working substrate (claim 1). Mayer discloses that the deposited conductive material is predicted to have very good adhesion (col. 7, lines 20-24).

The Examiner has not cited a motivation that is found in the references, but has only stated the conclusion that the combination is obvious. Neither has the Examiner made a finding as to the level of skill in the art or the likelihood of success (as to claims 15, 17, 18, and 26).

The invention of claims 15, 17-19, and 26 differs from Axtell and Mayer in the same way that it differs from Axtell and Joyce. Axtell is directed toward adhering a material to a substrate. Mayer predicts very good adhesion of the transferred material to the substrate (col. 7, lines 20-24). Thus, marking the transferred material of Mayer in the manner of Axtell would be a waste of time, because the composite is already adhered. Further, the unmarked material could not be washed off as described in Axtell.

Even if Axtell and Mayer could be combined, neither reference provides a motivation to

PATENT APPLICATION

Docket No.: N.C. 79,834

combine it with the other reference. The process of Mayer forms a pattern through the transfer of material onto a substrate. There is no motivation found in Mayer to combine it with a marking process, such as that found in Axtell. Further, since very good adhesion is predicted in Mayer, there is no motivation found in Mayer to combine it with a process of adhesion, such as is found in Axtell. Axtell discloses coating the marking material on the substrate by various methods that result in coating the entire substrate. (col. 7, lines 50-51.) There is no disclosure or suggestion in Axtell to apply the marking material in the form of a pattern, such as in Joyce. Axtell is directed to an adhesion problem, not a patterning problem. Neither would it make sense to coat the entire substrate of Axtell by a laser transfer process when simpler and more efficient techniques are disclosed. Further, Axtell is a marking process, based on selective exposure of a surface, while Mayer is a transfer process, based on laser induced forward transfer or LIFT. One of ordinary skill would not be motivated to combine an exposure method and a transfer method to form only one pattern.

New claims 27 and 28 add the limitation that the first laser removes the source material from the surface of the support by matrix assisted pulsed laser evaporation direct write (MDW). This laser transfer method is not disclosed in Axtell or Mayer. Mayer relies on the vaporization of a portion of the material (col. 3, lines 8-11) in order for the film to be transferred. However, in MDW a matrix material is mixed with the transfer material. Only the matrix material is evaporated and the transfer material is propelled to the receiving substrate unaltered. Further, Mayer uses a short, but high energy laser pulse. The pulse may deposit 4 to 6 times the vaporization energy of the metal film (col. 6, line 38-40), which "explosively" drives the metal vapor forward. This may not be compatible with transfer of an organometallic. However, in MDW, the laser energy is chosen such as to be sufficient to vaporize the first monolayers of the source material at the interface without causing the rest of the material to heat up above its decomposition temperature (p. 14, lines 16-19).

PATENT APPLICATION

Docket No.: N.C. 79,834

The Examiner rejected claim 16 under 35 U.S.C. § 103(a) as being unpatentable over Axtell in view of Mayer and further in view of Baum.

The invention of claim 16 differs from Axtell, Mayer, and Baum in the same way that it differs from Axtell, Joyce, and Baum. As explained above Axtell and Mayer cannot be combined. Even if such a combination were possible, Baum does not disclose the step of pretreating the receiving substrate with the first or second laser. Baum discloses heating a substrate to initiate chemical vapor deposition from a gaseous mixture in the vicinity of the substrate. One disclosed method of heating the substrate is to use a laser. Claim 16 is to pretreating the substrate, which is different from heating.

The Examiner rejected claims 15, 17-19, and 26 under 35 U.S.C. § 103(a) as being unpatentable over Fong (US 5,052,102) in view of Kim (US 4,970,196).

Fong discloses a method of electrically connecting an electronic element to a motherboard by coating the motherboard and element with a radiation sensitive metallic conversion compound, selectively irradiating the compound to form a metallic electrical connection, and removing the unconverted compound (claim 1). The only disclosed conversion compound is silver neodecanoate/xylene solution (col. 4, line 8). The only disclosed coating method is spin coating (col. 5, line 10).

Kim discloses a laser transfer method where a portion of a thin film of material is "blown off" of a transparent support by pulsed laser light (abstract). Kim discloses the transfer of only solid materials such as metals and ceramics (col. 2, lines 5-8). It is disclosed that the material melts (col. 3, line 67). Except for solids, no other materials are disclosed.

The Examiner has not cited a motivation that is found in the references, but has only stated the conclusion that the combination is obvious. Neither has the Examiner made a finding as to the level of skill in the art or the likelihood of success (as to claims 15, 17, 18, and 26).

Kim provides no motivation to use a solution such as the neodecanoate/xylene solution of

PATENT APPLICATION

Docket No.: N.C. 79,834

Fong as the thin film of material as Kim is only directed to solid materials. Fong provides no motivation to apply the conversion compound in a pattern instead of as a coating. The disclosed spin coating process is simple and well known in the art. Spin coating is also used in other parts of the process (Fong, col. 3, lines 27-29). The step of removing the non-irradiated compound is also simple. A similar step would also be used to remove the excess polyimide coating. There is no motivation in Fong to alter or eliminate these steps by applying a pattern of conversion compound by a more complicated technique, when similar simple steps would still be performed anyway. Further, Fong is an exposure process, while Kim is a transfer process. One of ordinary skill would not be motivated to combine an exposure method and a transfer method to form only one pattern. Further, the laser of Kim may be incompatible with transfer of organometallics without damaging the organometallic.

Claims 17-19 depend from and contain all the limitations of claim 15 and are asserted to distinguish from the references in the same manner as claim 15. Claim 26 differs from claim 15 in that it recites a "pulsed laser beam" and a "laser beam" instead of a "first laser" and "second laser," and is asserted to distinguish from the references in the same manner as claim 15.

New claims 27 and 28 add the limitation that the first laser removes the source material from the surface of the support by matrix assisted pulsed laser evaporation direct write (MDW). This laser transfer method is not disclosed in Fong or Kim. Kim transfers the material by evaporating a portion of the material itself (col. 2, lines 26-27). However, in MDW a matrix material is mixed with the transfer material. Only the matrix material is evaporated and the transfer material is propelled to the receiving substrate unaltered.

The Examiner repeated the rejection of claim 16 under 35 U.S.C. § 103(a) as being unpatentable over Axtell in view of Mayer and further in view of Baum. It is assumed that this was intended to be a rejection over Fong in view of Kim and further in view of Baum.

The invention of claim 16 differs from Fong, Kim, and Baum in the same way that it

PATENT APPLICATION

Docket No.: N.C. 79,834

differs from Axtell, Joyce, and Baum. As explained above Fong and Kim cannot be easily combined. Even if such a combination were done, Baum does not disclose the step of pretreating the receiving substrate with the first or second laser. Baum discloses heating a substrate to initiate chemical vapor deposition from a gaseous mixture in the vicinity of the substrate. One disclosed method of heating the substrate is to use a laser. Claim 16 is to pretreating the substrate, which is different from heating.

Double Patenting

The Examiner rejected claims 15 and 26 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of co-assigned Chrisey (US 6,177,151) in view of Axtell.

Chrisey discloses the laser transfer process of MDW.

The Examiner has not cited a motivation that is found in the references, but has only stated the conclusion that the combination is obvious. Neither has the Examiner made a finding as to the level of skill in the art or the likelihood of success.

There is no motivation in Chrisey to use a source material that can be transformed into a material of interest. Chrisey discloses an extensive list of transfer materials and applications for which they may be useful (col. 4, line 57-col. 6, line 54). None of these materials are precursors as disclosed in Axtell, but are useful on their own. There is also no motivation to improve adhesion using the method of Axtell as no adhesion problem is disclosed in Chrisey. Axtell only discloses coating an entire substrate. There is no disclosure of or suggestion in Axtell to apply the marking material in the form of a pattern, such as in Chrisey. Axtell is directed to an adhesion problem, not a patterning problem. Neither would it make sense to coat the entire substrate of Axtell by a laser transfer process when simpler and more efficient techniques are disclosed. Finally, Axtell is a marking process, based on selective exposure of a coated surface, while Chrisey is a matrix assisted pulsed laser evaporation direct write (MDW) transfer process.

PATENT APPLICATION

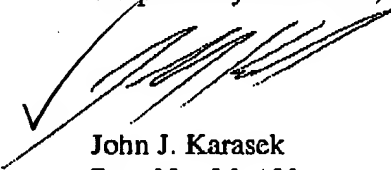
Docket No.: N.C. 79,834

One of ordinary skill would not be motivated to combine an exposure method and a transfer method to form only one pattern.

In view of the preceding, it is submitted that the application is now in condition for allowance.

In the event that a fee is required, please charge the fee to Deposit Account No. 50-0281, and in the event that there is a credit due, please credit Deposit Account No. 50-0281.

Respectfully submitted,



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CERTIFICATION OF FACSIMILE TRANSMISSION

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